moindre possible. La différence augmente à mesure que par la position donnée au commutateur on laisse persister l'aimantation pour plus longtemps en présence de l'armature attirée, ce qui produit une diminution dans la force de la machine. J'ai pu de cette manière parvenir au *maximum* du travail mécanique à spirale induite ouverte et à spirale induite fermée. Cela nous aide à expliquer la manière d'agir des courants induits pour produire la diminution du travail mécanique de la machine. En effet dans la position du commutateur qui donne la plus grande différence on conçoit que pour peu que le contact et l'aimantation se prolongent, les armatures se fixent et la machine cesse de marcher. Or l'action de la spirale induite fermée produit nécessairement deux effets qui tendent à rallentir la désaimantation : le premier c'est l'augmentation du courant de la pile, et par conséquent la force magnétique plus grande et plus persistante des électro-aimants ; le second effet de l'induction c'est de neutraliser l'extra-courant négatif qui certainement rend plus prompte la désaimantation.

Enfin, ce qui rendrait ces expériences rigoureuses serait la détermination avec des calorimètres distincts de la quantité totale de la chaleur développée en même temps par la pile et dans les spirales de l'électro-aimant, le circuit induit étant tantôt ouvert tantôt fermée.

XVI. "On the Influence of the Gulf-stream on the Winters of the British Islands." In a Letter from Professor HENNESSY to Major-General SABINE, V.P. and Treas. R.S. Communicated by Major-General SABINE. Received May 24, 1858.

35 Upper Leeson Street, Dublin,
May 19, 1858.

MY DEAR SIR,—In your work on 'Pendulum Experiments,' and subsequently in a paper printed in the 'Philosophical Magazine' for April 1846, you have directed attention to the influence of the Gulf-stream on the winters of the British Islands. You have been led to attribute the remarkably mild winters which we sometimes experience, to an abnormal extension of the warm waters of that stream towards our latitudes. In this view I entirely concur, and beg to submit the following additional proof of its correctness.

An abnormal extension of the Gulf-stream in the direction of the

British Isles necessarily implies that the waters bathing our coasts acquire a temperature which exceeds their mean temperature for the season of the year at which the extension takes place. The temperature of the air over the sea, and finally of the air over the islands, becomes sensibly increased. The entire temperature at any point will thus depend chiefly on what it gains from sunshine, and from the warm sea-air, and on what it loses by radiation. If the excess of what it gains from sunshine over its losses by radiation be considerable compared to its gain from the influence of the sea, the temperature will depend principally on the latitude. If, on the contrary, the thermal influence of the sea be very considerable, places at different latitudes may possess nearly equal temperatures. It follows that during cold winters we should expect a greater difference between the temperatures of the southern coasts of Great Britain and Ireland, and the remainder of their coasts, than during mild winters. It also follows, that during warm winters the difference of temperature between stations situated on coast and inland stations having nearly the same latitude, should be greater than during cold winters.

Although I have not yet finished all the calculations necessary for the complete illustration of these conclusions, I have been enabled to show that during some recent winters the observed results as to temperature entirely conform to these laws.

The mildness of the winter which has just passed away, has been universally remarked, and Mr. Glaisher's returns for the meteorology of England and Scotland during December 1857 fully illustrate the matter. I have not yet received the returns for January and February, but I feel assured that they will exhibit corresponding results.

During December 1857 the temperatures of the coast stations were as follows:—

South Coast.		North and West Coasts.		East Coast.	
Helston	51°·2	(Orkney) Stornoway	46°·1	Aberdeen	44°·3
Truro	49·3	Elgin	45·3	Arbroath	43·8
Teignmouth	48·8	Liverpool	48·3	Pittenween	45·8
Ventnor	49·2	Isle of Man	48·9	N. Shields	45·6
Worthing	48·0			Scarborough	45·0
Hastings	47·3			Holkham	44·5
Ryde	46·9				
Mean	48·7		47·1		44·8

Mean of all the coast stations	47·0
Excess of south coast above north and west coasts	1·6
Excess of south coast above east coast	3·9
Mean excess of stations on the south coast above all the rest	3·0

December 1856.

South Coast.		North and West Coasts.		East Coast.	
Helston	46°7	Stornoway	39°5	Aberdeen	39°6
Falmouth	45·8	Elgin	39·5	Arbroath	36·4
Truro	45·6	Liverpool	42·8	Anstruther	38·4
Teignmouth	43·6	Isle of Man	42·4	N. Shields	39·7
Torquay	44·5			Scarborough	40·9
Ventnor	43·9			Holkham	39·6
Ryde	43·0				
Worthing	41·0				
Hastings	41·8				
Mean	44·0		41·0		39·1

Mean of all the coast stations	41·8
Excess of south coast above north and west coasts	3·0
Excess of south coast above east coast	4·9
Mean excess of stations on the south coast above all the rest	4·1

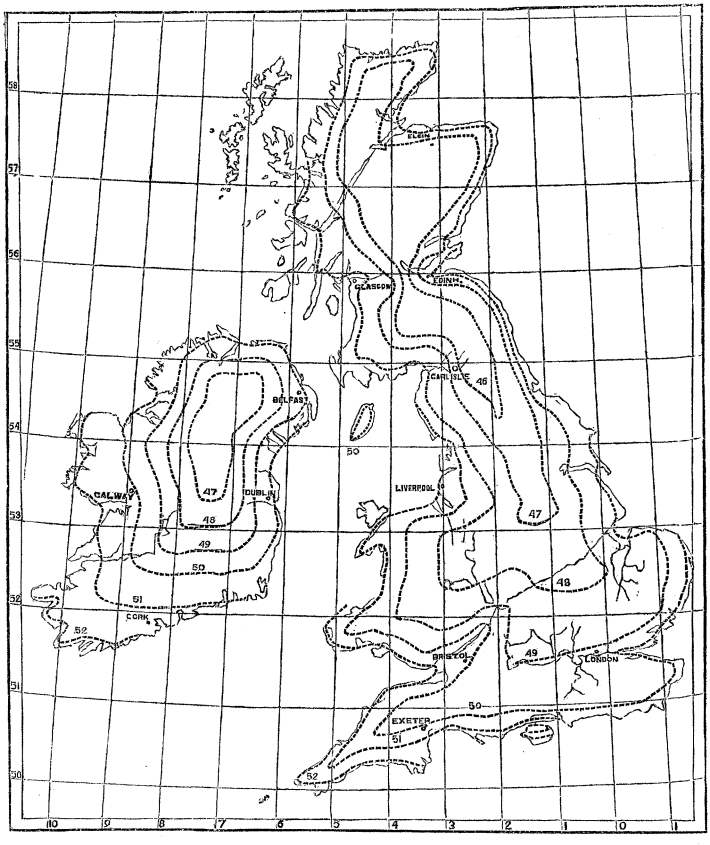
December 1855.

Helston	44°6	Elgin	36°9	Aberdeen	36°7
Falmouth	43·6	Liverpool	38·9	Arbroath	35·1
Truro	43·3	Isle of Man	39·4	Anstruther	35·7
Torquay	40·6	Sandwick (Orkney)	39·4	N. Shields	35·9
Teignmouth	41·3			Scarborough	36·7
Ventnor	40·4			Holkham	35·8
Ryde	38·8			Boston	35·9
Worthing	37·7				
Mean	41·3		38·6		36·0

Mean of all the coast stations	38·8
Excess of south coast above north and west coasts	2·7
Excess of south coast above east coast	5·3
Mean excess of south coast stations above all the rest	4·35

The December of last year, which was much warmer than the Decembers of the two preceding years, appears thus to comply with such conditions as to temperature as would lead to the conclusion that a greater extension of the Gulf-stream had existed about the end of 1857, than towards the close of 1856 or 1855.

Isothermals of the British Isles.*



It will be interesting to compare the mean temperature of a southern inland station, where the observations may be depended upon as being of the best class. The mean temperature of Oxford during the December of 1857 was 45°·0; in December 1856, 40°·5; in December

* The figures denote the mean annual temperature, in degrees Fahr., corresponding to each isothermal line.

1855, 37°·2. All the stations on the west coast are situated in higher latitudes, yet their mean temperature was in excess of that of Oxford in December 1857 by 2°·1; in the colder Decembers of 1856 and 1855, by 0°·5 and 1°·4 respectively. During the warmest month, the mean of all the coast stations exceeded the temperature of Oxford by 2°·0; and during the other two Decembers by 1°·3 and 1°·6 respectively.

I propose to make more complete calculations, which will embrace the other months belonging to the winter; and by comparing the results during different years, it is probable that corresponding inferences will be suggested regarding the variations of mean temperature which are incapable of explanation by changes of solar radiation alone.

I was induced to select December at first, because the amount of sunshine received in our hemisphere being least during that month, it was natural to expect that the comparative effects of the other thermal influences would be most distinctly manifested.

Having been for some time occupied in studying the distribution of heat over islands, I have been led to the general proposition, that the isothermals may be represented by curves having some relation to the coast-line, and that the positions of the centres of these curves depend upon the relation between solar influence and oceanic temperature. At seasons when the latter becomes important, compared to the former, the isothermals tend to assume re-entrant shapes similar to the mean annual isothermals of Ireland. When the isothermals of a mild winter month, like December of 1857, shall be laid down, I anticipate that they will distinctly exhibit the increased thermal influence of the ocean by presenting such an appearance.

HENRY HENNESSY.

Major-General Sabine, V.P.R.S.

XVII. "On the Influence of Temperature on the Refraction of Light." By Dr. J. H. GLADSTONE, F.R.S., and the Rev. T. P. DALE, M.A., F.R.A.S. Communicated by Dr. GLADSTONE. Received June 17, 1858.

(Abstract.)

Those who have occupied themselves with the determination of refractive indices, must have noticed that changes of temperature